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EDITORIAL

RIGHT MISTAKES

SOMEONE recently asked the writer how many students he had in attendance upon his classes. His answer to the query was: "Oh! about twenty per cent."—which is about what any teacher might have responded.

A pupil—but not a student—excused an error upon his examination paper the other day by saying that he had made the "wrong mistake"—the *wrong* mistake!!

And it developed to be just that—for what he had intended to write as an answer was actually more impossible than what he did write.

In that particular case, wronging the mistake righted it a bit—but the kind of *right mistakes* which occasioned the caption above is the kind of mistake which by initiative and ingenuity can be converted into a blessing.

Recall the experience of Perkins the English chemist. He mistakingly discovered the first aniline dye—and brought the giddy color of the tar barrel within the reach of everyone.

Before Perkins, only kings and queens could afford to wear clothes dyed in Tyrian purple—but after his right mistake—little children in the slums go about with clothes of a purple which once would have been the envy of royal children.

Experimenting with coal tar fractions seeking a quinine substitute, Perkins poured into his reacting flask, a liquid from the wrong bottle. Instead of a clear solution, there came a mess of purple, so strong in tinctorial value, that Perkins at once appreciated its dyeing possibilities.

No quinine had come—but something else—as concentrated a coloring matter as any chemist had ever seen,—came to pass from the

stupid error. Perkins was quick to capitalize his mistake and out of his initial find grew the whole key industry of the coal tar dyes.

Roentgen was experimenting with vacuum tubes when his hand accidentally passed in back of a fluorescent screen and cast its shadow over the screen. He noted the density of bone and the lack of flesh shadows and immediately grasped the significance of these marvelous properties of the cathode rays. True scientist that he was, he at once gave away to the world his epoch-making find. That was another right mistake.

Kekule blundered upon his benzene structure through choice of a wrong omnibus which took him country-gazing instead of to his city destination. Coming back he dreamed of molecules and on waking evolved the most fruitful of all the theories of molecular structure.

And so we might go on in merry repetition.

How Nobel blundered to his dynamite find—and Goodyear to his rubber, *how* Sweaton mistook a clay for another—yet out of his error grew Eddystone cement—and all other cements.

But certainly sufficient proof has already come to accept the homely wisdom in Samuel Smiles' Self-Help—"that he who never made a mistake—never made a discovery."

And the making of "right" mistakes is as much a tribute to ingenuity as the making of *wrong* mistakes is a type of inanity.

IVOR GRIFFITH.

SELECTED EDITORIAL

CO-OPERATION BETWEEN PHYSICIAN AND PHARMACIST*

WHEN JAMES PERCIVAL wrote his "Principles of Ethics" for the medical profession in 1803, a special section was devoted to the importance of proper co-operation between the physician and pharmacist. The recognition of definite brotherhood between the professions has existed since the beginning of medical history. Galen, whose doctrines governed medical practice for more than 1200 years, began with a pharmacist shop near the Forum in Rome. From his day to ours both professions have made tremendous strides. The modern pharmacist must be a well educated man with special knowledge of chemistry and biology, as well as of the compounding of drugs and their preparations. The armamentarium of therapeusis includes substances so potent that dosages are measured in millionths of grams or cc. and products so delicate that their preservation demands large and costly equipment. The physician thoroughly trained in therapeutics must depend on the pharmacist to provide what he desires for the patients rpomptly and efficiently.

It has been urged that the development of the package medicine has made prescribing a lost art. If this be true, it is exceedingly unfortunate for the public, since the competent therapeutist is able to render relief to the patient and indeed to promote the cure of his disease in a manner that arouses amazement in the medical hack who has learned to depend on fixed substances as the basis for his prescribing. The old time practitioner used to inquire symptom after symptom and put something in the prescription to cover every indication. The modern practitioner makes a careful diagnosis and is able to employ potent remedies that attack the cause of the ailment, as well as to prescribe effective preparations for the relief of uncomfortable symptoms.

The Pharmacopœia of ancient days included every preparation that any physician might want to prescribe, regardless of any proof of its potency or virtue. The modern Pharmacopœia is a carefully

*By Dr. Morris Fishbein, editor *The Journal of the American Medical Association.*

selected list of preparations of dependable composition and in the majority of instances of dependable action. For those physicians who still depend on empirical proof of therapeutic virtue, the National Formulary provides a vast number of time-tried preparations. For the newer drugs of established composition and therapeutic claims, New and Non-official Remedies, prepared by the Council on Pharmacy and Chemistry of the American Medical Association, is a reliable guide. No doubt, the most useful of all of the available references for the physician who wants to make his therapeutics sound and efficient is the little book called "Useful Drugs." From the tremendous amount of material available in the Pharmacopœia, the Formulary and New and Non-official Remedies, a body of experts has selected some 250 drugs and preparations with which it is possible to practice efficiently. It is important that both the pharmacist and the physician be thoroughly familiar, at least, with this material. The promotion of scientific prescribing and dispensing will increase confidence in medicine and in pharmacy and is unquestionably the best method of attacking pseudo-scientific and fanatical cultists who oppose medical progress.—Reprinted from *C. R. D. A. News.*

ORIGINAL ARTICLES

THE STORY OF INKS*

By C. C. Pines

THE ORIGIN of the written language is not known but from the earliest history of man many different means of recording and communication have been employed.

In Southern France, archeologists have discovered the relics of a pre-historic civilization where a semblance of domestic life existed which it is difficult for the modern mind to conceive of. Here, deep in his cavern home, the cave man, signaled to the future, his superiority over the wild beasts among which he lived, exercising that attribute which man alone possesses—the desire and ability to record his activities—by scratching into the rocky walls of his home, pictures of the very beasts he was forced to battle with for existence.

PICTURE WRITING

Thus, we see that far back into the past, picture writing was begun which later developed into the art of character writing where the writing was done on stone, clay or wax tablets by means of a sharp pointed instrument or stylus. The obelisks of ancient Egyptian antiquity, some of which are preserved to this day, are examples of writing done on stone. Doubtless some of my readers have seen Cleopatra's Needle, an obelisk of about 1500 B. C. which stands in Central Park, New York City. This stone antique bears inscriptions relating to the reigns of the ancient Egyptian Kings. Clay tablets were used to write upon by the ancient Persians and Assyrians and many specimens showing their peculiar cuneiform or wedge-shaped characters are displayed in museums at the present time.

THE FIRST INK

As civilization developed, the invention of materials to write upon such as the papyrus of the Egyptians was brought about. Papyrus, the earliest form of paper and the word from which the modern word paper is derived, was made from the

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fibers of the papyrus, a rushlike plant of the Sedge family. The invention of the papyrus necessitated also the invention of a fluid or semi-fluid capable of being used thereon, first by the brush and later by the pen. Thus, we have an inkling into the development of inks.

BURNT INK The word ink is probably derived through a modification of the Latin encaustum which was the name given to the purplish red ink with which the Roman Emperors signed their edicts. Encaustum literally means burnt in. The signatures were, figuratively speaking, burnt into the edicts by means of the red ink. The French for ink is encre, the Old French enque and the Old English is enke or inke which words could have been derived from a shortening of the word encaustum.

For the cross-word puzzle enthusiasts, the fourteen letter word atramentaceous meaning inky, may be of use.

Ink is known to have been used by the Egyptians as early as 2500 B. C., old papyri (which are in existence today) dating back to that time were written upon with a black ink which was a mixture of lampblack and glue with a preservative to prevent decomposition. In China, the invention of ink is ascribed to Tien-Tchen, who lived between 2697 and 2597 B. C. China ink or India ink was made by the Chinese from the soot produced from the smoke of pines and the oil in lamps mixed with the isinglass of asses' skins and musk to correct the odor of the oil. The Chinese moulded their ink into cakes or sticks because of a scarcity of bottles in ancient times. The Hebrews and the Arabians had similar methods for making ink. Ink was used in Bible times for the book of Ezekiel, Chapter Nine, records the action of the man with the inkhorn. "And the Lord said unto him, (the man with the inkhorn), Go through the midst of Jerusalem, and set a mark upon the foreheads of the men that sigh and that cry for all the abominations that be done in the midst thereof." Ink here was used as a matter of life or death for if we read further we find the following passage, "Slay utterly old and young, both maids and little children, and women: but come not near any man upon whom is the (ink) mark: and begin at my sanctuary."

Dioscorides (B. C. 40-30), physician to Antony and Cleopatra, in a dissertation on the medicinal herbs, gives the proportion of lampblack and oil to be used in the manufacture of ink.

Vitruvius (B. C. 30-A. D. 14), the Roman Engineer, describes a method of preparing ink for mural decoration:—soot from pitch

pine being collected from the walls of a specially constructed chamber, then mixed with gum and dried in the sun.

Pliny, the Elder (A. D. 23-79), mentions that writing could be removed by means of a wet sponge. Martial (A. D. 100), a Roman Poet, sent a sponge with his newly written book of poems, so that the writing could be effaced if the composition did not merit approval. Although the Romans used an oil carbon ink, the last two references must either refer to a lampblack (carbon) gum ink or to a sepia ink for the oil carbon preparation could not have been removed by sponging with water.

PINK INK Somewhere between the civilization of Egypt and the "Grandeur that was Rome" the art of producing chemical writing fluid was lost, the Romans did not use them but as recorded by Cicero, depended upon the rich brown excretion of the cuttle fish for their writing fluid. It was not until about 200 A. D. that the employment of ink again became popular. Red inks, blue inks and inks of Tyrian purple were used.

The transition from carbon inks to iron gall inks which are the ordinary blue black writing fluids of today took place gradually from the tenth to the twelfth century. About the same time the introduction of flax or linen paper provided a suitable material to be used with the inks. Iron gall inks probably came into use at a comparatively early date in Ancient Syria because of the proximity of the most important raw materials, the gall nuts and the iron sulphate. The high state of civilization which flourished ages ago in Asia Minor was probably due to the use of ink by which a flexible means of communication and recording was made possible.

IRON INK The monk Theophilus, who wrote an encyclopedia of Christian Art in the eleventh century describes among other things, a method of preparing ink for writing from thorn wood (tannin bearing bark). An aqueous extract of the wood was evaporated to dryness and the powder mixed with green vitriol (iron sulphate). This is the earliest reference which has been found to an iron tannin ink.

Albertus Magnus (A. D. 1193-1280) also refers to the preparation of an ink from green vitriol in his treatise De Rebus Metallicis.

The first manufacturer of inks of whom we have any record was a Frenchman, M. Guyot, who made and sold ink in Paris in 1609. William Lewis, an English Physician, in 1748, has the credit of being the first to make writing fluids the subject of scientific experiments and to draw conclusions as to the proportions of the various ingredients required to make a really permanent ink. In 1890 Schluttig and Neumann, after extensive investigations, published a formula which they believed would give the best possible iron gallotannate ink. This ink was adopted by the State of Massachusetts as the standard for all official purposes. In 1912 the Prussian Government issued regulations requiring that documentary or record inks should meet certain standard specifications. The United States Government incorporated in its specification for "Treasury Standard" writing fluid the requirement that ink furnished should be equal in every essential to a standard ink made according to the formula adopted by the State of Massachusetts.

STANDARD INK Thus, it can be seen from this short history of ink that no standard ink was required for recording purposes until 1890 or later which was indeed unfortunate because wills, deeds, birth certificates and the like should be written with ink that is as lasting as the paper they are written on.

Ancient inks were of many varieties, the earliest writing inks were composed of lampblack or other form of carbon in admixture with a glue or gum, and were prepared for use by rubbing on a palette with water. The Persians used an ink which was made by roasting date stones in a stoppered earthenware vessel, then grinding and sifting the contents and making into a mixture with gum arabic and water. This Persian ink probably contained very little carbon but most likely contained black organic compounds of a tar-like nature.

ROYAL INK The inks of Tyrian purple previously mentioned were made from the secretion found in a small cyst, adjacent to the heads of certain of the Murex, a kind of mollusk. This deep crimson dye was possibly the first to be used in dyeing wool or linen. It was an extremely costly dye and the phrase "to be born in the purple" refers to the fact that a child had to have parents of considerable wealth to see the light of day in a room decorated with drapings dyed with Tyrian purple. Pliny the Younger (A. D. 61-115), stated that Tyrian purple cost $150 a pound.

Sepia which Cicero wrote about was also of animal origin. This black or dark brown pigment is contained in a secretion formed in a special glandular organ of the cuttle fish or squid (Sepia officinalis). Sepia as a natural ink antedates every other ink in the world, artificial or otherwise. It has great pigment value, one part of sepia immediately renders one thousand parts of water opaque. It is the most lasting ink of all natural substances.

In the middle ages both the carbon inks and the iron gall (iron tannin) inks appear have been in common use, although it is thought that the iron gall inks were most generally used as the secret of making a satisfactory carbon ink was gradually lost. The iron gall inks from the eleventh century until about 1856, were known as oxidized inks while our modern iron gall (blue black) inks are unoxidized. The oxidized inks were so-called because they were made by mixing the gall (tannin) extract with the iron sulphate (Copperas) and gum, leaving the liquid exposed to the air until it had yielded a mixture of colloidal and insoluble iron tannates which remained more or less in suspension in the liquid. This type of ink was poor for writing purposes for the ink was practically all on the surface of the paper, no penetration taking place because the iron tannates were precipitated before the ink was used whereas to have a penetrating action into the fiber, to make the writing more nearly permanent, the ink should oxidize after coming in contact with the paper.

The modern inks are legion, there is an ink for practically every purpose. The inks which are the most interesting to read about and the most widely used by all of us are the writing inks. Writing inks are fluid substances containing coloring matter either in solution or suspension and commonly in both conditions that can be used with a pen to mark letters, characters or other designs on any surface prepared to receive it. They may contain any pigment which can be dissolved or suspended in a suitable medium. Inks may be classified roughly into five classes: aniline inks, logwood inks, nut gall inks and miscellaneous inks such as invisible inks, etc.

COAL-TAR INKS Aniline inks are fluids made by dissolving aniline dyes or as they are often called, coal tar dyes, in distilled water and adding a preservative such as carbolic acid (phenol) or thymol to prevent the formation of mold growths. An ink of this type can readily be made by dissolving 5.5 gm. (about one-fifth of an ounce avoirdupois) of the dyestuff in 1000 cc. of

distilled water. For ordinary writing purposes these inks were very satisfactory because they contain no acid which will corrode steel pens but they are "washable" or "fugitive" and writing done with them is easily smeared or removed by the application of water. The word "washable" is misleading for it really means, capable of being washed without damage to fabric or color but as was mentioned before "washable" inks cannot be washed without smearing or removing the color although the manufacturer may mean to imply that it can be easily removed from fabric and the like, in case it is accidently spilled. When writing is done with this class of ink there is no chemical action with the paper but only a deposition of the dye as the water evaporates. Of interest in connection with the use of aniline inks was a case in which the Fiji Islanders were concerned. One ink manufacturer was surprised at the amount of blue ink which the Islanders used, so a curious salesman of the firm wondering if it could be due to a sudden advance of learning, decided to stop and look into the matter. To his surprise he found that the aniline ink was used by the natives to dye their straw hats a striking blue color.

SOOT INKS

Carbon inks, known commonly as China and India inks are both essentially made of very finely powdered particles of lampblack, a form of carbon, held together by some kind of glue. The China ink used mainly in China is manufactured in the form of sticks or cakes which are rubbed down in water for use with small brushes instead of pens. India ink is procurable in liquid form and is made by mixing gum arabic, shellac, and borax, with carbon in suspension. Camphor is sometimes an ingredient of India ink, also. The borax reacts with shellac to form a kind of soap which is soluble in water, but which after drying forms an insoluble film on the paper. The gum arabic is thought to act as an aid to hold the carbon in suspension. Some brands of India inks are manufactured for ordinary writing purposes but their widest application is as drawing inks, used by architects, engineers and artists, to whom their intense blackness overbalances their fast drying properties and their heavy sluggish flow. These drawbacks prevent their more extensive use as ordinary writing inks.

Carbon inks should be used on paper which is just slightly absorbent for this type of ink has the coloring matter in suspension and

the color will not impregnate the fibre unless the paper is sufficiently absorbent. Writing done on a nonabsorbent surface will chip off when dry or it can be mechanically removed. These inks are very permanent when used on slightly absorbent materials, for light and chemicals do not affect them.

LOGWOOD INKS Logwood inks are made from extract of logwood, crystallized sodium carbonate and potassium chromate. Logwood is the heartwood of a tree scientifically called, Haematoxylon campecheanum. The tree is a native of Central America and has also been introduced into the West Indies. The heartwood which is usually marketed in small chips is put through a process very much resembling the steeping of tea in order to extract the coloring matter. The inks write a purplish black and dry readily forming an intense black into as well as onto the paper. The writing can be freely washed without danger of smudging, but it decomposes upon ordinary exposure to air, the deposit chipping off of the paper in small flakes.

The common blue black inks are nutgall (iron tannin) inks. The base ingredients of these inks are tannic and gallic acids, two extracts of the nutgall, and ferrous sulphate, commonly called copperas or green vitriol. These chemicals form a nearly colorless solution which will darken by oxidation upon exposure to air. This colorless liquid on coming in contact with paper, reacts with the fibers of the paper forming a black iron compound in the fibers, so that writing remains as long as the paper it is written on lasts. However, the colorless liquid just mentioned could not be used for writing because the writing would be practically invisible at first. For this reason a blue dye such as indigo or a water soluble blue aniline dye is added, then on writing, the words are blue and in time the blue fades and black predominates because of the formation of ferric salts due to the oxidation of the ferrous tannate and gallate. Thus, blue black inks are those which write blue and turn black.

Nutgall inks are quite permanent and are recommended by the leading ink manufacturers as not only the best but the only record ink for commercial and documentary purposes. It is not surprising, therefore, that the branches of the Federal Government and those states requiring the use of an official ink recognize and designate nutgall inks as best for all enduring records.

INK RIVER Iron tannin inks are sometimes formed naturally, such a phenomenon has been observed in Algeria, a country in northern Africa, where there exists a "river of ink." Chemical examinations of the waters of the streams combining to form this river revealed that one of the streams is impregnated with iron from the soil through which it flows while the other stream carries tannin from a peat swamp. When the two streams joined, the chemical action between the tannic acid, the iron and the oxygen of the water caused the formation of the black ferric tannate, making a natural river of ink.

However, man does not depend on nature's ink well but manufactures large quantities of nutgall ink from materials gathered from different parts of the globe. The process of manufacture begins with the extraction of the tannic and gallic acids from the nutgalls, abnormal growths of the oak tree, the Quercus infectoria, which grows abundantly in Syria, Asia Minor. The nutgalls from this source are the Aleppo galls which yield the best tannic acid for the manufacture of inks. Centuries ago, inks were made directly from the extracts of the galls, but today, the control chemist uses exact amounts of gallic and tannic acids with the result that a uniform ink is produced. Tannic and gallic acids in solution in contact with air gradually turn a light brown and in combination with a mineral salt, such as ferrous sulphate, turn a deep black color. In time a black precipitate forms which is soluble in acid so the ink manufacturer adds sulphuric or hydrochloric acid to the ferrous sulphate solution before the tannic-gallic acid solution is added to prevent any precipitation which might be produced such as exposure to air in an open ink well. It is obvious that a solution used for writing would penetrate the fibers much more readily than a liquid with insoluble material present, therefore a solution is to be desired so that a more nearly permanent record would be obtained and also for fountain pen use where insoluble material would clog the pen. In addition to the ingredients just mentioned, carbolic acid (phenol) is used in the inks to eliminate the possibility of moulding.

NUTGALL INK Nutgall ink is a fairly permanent type of ink withstanding the ravages of time, sun, wind and rain. One of the large ink manufacturers of this country has a page from a handwritten book, dated 1445 and the writing, which was done with nutgall ink, is as clear and black as the day it was written. In the

great Baltimore fire of 1904, J. S. McDonald Company, jewelers, were burned out and their books lay in water for a week. On recovery, the writings were found perfectly legible. Similar cases are on record where sudden floods and other catastrophes would have meant ruin to firms' books and records, had they not been safeguarded with this permanent ink.

SECRET INKS A consideration of miscellaneous inks leads first to an interesting type, the "so-called" secret, "sympathetic" or invisible ink. This kind of ink is used in peace times for confidential correspondence and in war times for secret messages. A host of different materials can be used to make up an invisible ink. During the Indian Mutiny of 1857 rice starch was used, writing with this ink being developed by means of iodine. Some of the materials used during the World War were substances of everyday use which could be bought openly and others were uncommon organic compounds. The common sympathetic ink is one made from cobalt chloride. A weak solution is used for writing, which drys a pale pink and the writing when warmed changes to a distinct blue which is easy to read. A solution of phenolphthalein can be used as an invisible ink, the writing being made visible by exposing to ammonia vapors. Onion juice or milk can be used, the writing being made visible by heating just enough to scorch the dried juice or milk.

Another type of miscellaneous inks is the typewriter ribbon inks. A form of typewriter was patented in England in 1714 but it was not until 1873, after a series of developments, that the device was fairly complete for practical use. The inked ribbon had to be produced as a very important part of the machine and today, the manufacture of typewriter ribbons is an industry in itself. The base of the inks used for record ribbons is usually a slow drying oil like castor oil mixed with oleic acid. The oil soluble coloring matter is ground in a mill with the oleic acid and the mixture incorporated in the oil. The ribbon to be inked is passed through rollers, set at a definite distance apart, between which the ink is fed from a reservoir adjoining the rolls. The two-color ribbons such as the red-black ribbons are inked in one operation by passing through rollers which are fed by ink from two reservoirs. A partition at the rollers prevents the black ink from mixing with the red ink or vice versa. The

finished ribbon has an uninked line the size of the partition directly in the center into which the inks work from both sides until it is entirely inked.

Care must be taken that the fluidity or viscosity of the two inks is the same so that one color will not bleed into the other as the ribbon is inked. While using a typewriter one may notice that the written words are not so plainly impressed on the paper toward the end of a long letter as they were in the first part of the message, this occurs bcause the ink has been used up to some extent from that portion of the ribbon which has been in use continuously. If the typewriter is not used for about an hour, ink from the unused part of the ribbon will flow into the used part showing a good "recovery" which in turn shows a well-inked ribbon.

PRINTERS' INK Printers' inks which have been used ever since the invention of the printing press about 400 years ago, have as their main pigment, carbon. Lampblack, a form of carbon, made by burning rosin, turpentine, pitch, and petroleum oils, was used in the first printing inks until 1864. At that time, carbon black, made by burning natural gas, by a certain process, was introduced and at the present time it is the indispensable material used in a finely divided condition in printing inks. Lampblack is still used to a limited extent, generally mixed with a certain proportion of carbon black. The inks are made by mixing the pigments in boiled drying oils, such as linseed and tung together with driers such as lead, cobalt and manganese in the form of their resinates or linoleates. Other ingredients such as varnishes, mineral oils and petrolatum may be added in making inks for particular kinds of printing work. Nine pounds of ink containing one pound of carbon black and eight pounds of oil and other materials will print ninety copies of a three hundred page octavo book. News inks are made by mixing carbon black and mineral oil in the approximate proportion of one pound of carbon black to eight or nine pounds of oil. This nine to ten pounds of ink will print twenty thousand pages of the average newspaper size.

A knowledge of inks is often valuable in deciding whether documents such as wills, deeds, and similar official records are authentic or not. In one case, it was alleged that the writing on a document was written in 1868. On examination of the red ink used, it proved

to be one made from the synthetic dye eosin, which was not discovered until 1874 and not used in inks until several years later, which showed the writing to be fraudulent. In another case of a will which was altered by writing over the original writing, it was found by treatment with the proper chemicals that the two different inks, used for writing over the top of the original ink, could be dissolved, exposing once again the message which the rightful testator had written. Sometimes documents are found on which the writing has faded out from age. This writing may in some cases be restored by the use of the proper chemicals. There is little hope of restoring writing made with inks that are solutions of dyes, because practically nothing is left on the paper when the color has disappeared. If the ink contained iron tannate (blue black ink), there will always be some brown oxide of iron left on the fibers of the paper, and this can be changed into a more intensely colored iron compound. The simplest treatment is to expose the paper to the fumes of ammonium sulphide, which will change the iron oxide into black iron sulphide. Another method is to apply a solution of tannin, which will form black iron tannate.

When it was decided to exhibit the Declaration of Independence in the Library of Congress, the suggestion was made that the writing should be restored with chemicals. Owing to the danger of damaging the document irreparably during the treatment, and because of the possible after-effects of the chemicals upon the paper this was not done. Thus, we see it may or may not be wise to restore faded writing.

THE NATION'S INK BILL

The nation's ink bill is considerable. It has been estimated that there has been three to four million dollars' worth of writing ink used during the past year in the United States. If drawing, lettering and inks for similar purposes, not including printing inks, are estimated along with writing inks about six million dollars were expended during 1929. The printing ink industry is very vast, it is believed that New York City and vicinity uses ten million dollars' worth of ink annually. The total consumption of all kinds of inks probably amounts to one hundred million dollars per year.

Although one might think that the state of a nation's civilization could be judged by the amount of soap which it uses, it would seem that it might be judged even more accurately by the amount of ink used yearly in recording its accumulated knowledge.

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Bureau of Standards Circular No. 95.

OUR LEGAL AND MORAL OBLIGATIONS*

By Robert P. Fischelis

ONE OF THE FUNCTIONS that has been assigned to me in connection with these exercises is an explanation, or perhaps a review, of the provisions of the New Jersey Pharmacy Law, so as to point out to you possible pitfalls and send you away with a clearer idea of your responsibility under this law. I need not go into great detail because all of you have studied the Pharmacy Law at least sufficiently to pass the oral test which was a part of your practical examination. However, it has been the feeling of the Board that in addition to acting as examiners in Pharmacy some effort should also be made to act as instructors on the legal phases of the practice of pharmacy. As you enter upon the practice of your profession you should feel free to consult the Board whenever you are in doubt about the law or its application to any situation which may arise during the course of your work. We shall welcome your inquiries and endeavor to answer them to the best of our ability.

Beginning with Section 2 I might point out that you are now qualified to supervise the work of apprentices and unregistered employees in a pharmacy. This means that prescriptions can be compounded under your immediate supervision and that drugs, medicines and poisons can be sold under your immediate supervision. That word "immediate" is important. It does not mean that you may be out on the sidewalk or merely somewhere in the building while your apprentice is compounding a prescription or selling a poison. It means exactly what it says; namely, that you must personally see what the apprentice is doing. Yours is the responsibility for his mistakes. Give the apprentice every opportunity to learn and to acquire the technic of compounding but do not require him to substitute his brain or his eye for yours. You are not permitted to leave your pharmacy without the supervision of a Registered Pharmacist. If prescriptions are compounded or drugs, medicines or poisons are sold during your absence, you, as the owner of the pharmacy, are equally liable for the violation of your unregistered clerk.

The requirements of Section 4 of the Pharmacy Act are perhaps more familiar to you than any others because they relate to the

*Address to the newly registered pharmacists at the exercises for the award of Certificates of Registration in the State House, Trenton, N. J., December 2, 1930.

qualifications for registration. However, it may be well to call your attention to the fact that on January 1, 1931, you must display, with your newly acquired certificate of registration, a renewal certificate. An application for this renewal will be mailed to you in due time. When you receive the renewal certificate you must display it conspicuously with your certificate of registration. This renewal of certificates is an annual requirement, and if you keep the Board of Pharmacy advised of your whereabouts, you will receive the application for renewal sometime between November 15th and December 1st of each year. This gives you a full month in which to obtain the certificate of registration, but do not send in your application on December 31st and expect to receive your renewal on January 1st.

If you acquire a pharmacy or become the manager of a pharmacy for someone, it is necessary that your name shall appear in or upon the window of that store so that it can be read from the outside. Your certificate of registration must be displayed inside the store conspicuously so that the public may know that the store is properly supervised. Do not leave your certificate in a store where you are no longer employed. Even with the best of intentions owners of pharmacies sometimes cause certificates to be misused, and if this is done in your absence, you are just as guilty as though you knew what was going on.

This section also gives the Board of Pharmacy power to suspend or revoke a certificate of registration when the pharmacist holding the certificate is guilty of chronic or persistent drunkenness or addiction to the use of narcotic drugs. Two convictions of violations of the anti-narcotic laws and liquor laws, or any other laws relating to the practice of pharmacy, are sufficient to cause revocation of your license to practice.

If you employ an assistant pharmacist at any time, do not leave him in charge of your store more than four hours in any day of twenty-four hours, and do not leave him in charge for four consecutive hours or more at any time. This section provides that assistant pharmacists may remain in charge of a pharmacy during the temporary absence of a registered pharmicist. Temporary absence refers to a short period during which the pharmacist may be out to lunch or gone on some brief errand, but the total of these temporary absences in any single day must not exceed four hours. It is not proper for an assistant pharmacist to open a store every morning at eight and remain in charge until noon, nor is it proper for him to come on

at seven in the evening and remain until closing, day after day. Such a procedure makes a registered pharmacist out of the assistant pharmacist, and the Legislature of this State never intended that.

Section 5 of the Pharmacy Law empowers the Board of Pharmacy to employ inspectors whose duty it shall be to examine and inspect pharmacies and drug stores and all places wherein drugs, medicines and poisons are kept, sold and dispensed at retail. These inspections are for the purpose of detecting violations of the various provisions of the law.

At times we meet pharmacists who resent the visit of an inspector and who refuse to allow the inspector to enter their prescription rooms or other departments not located in the front of the store. This is not only a foolish attitude, but it is an unlawful one. Any person who conducts a pharmacy and observes the regulations need not fear the visit of an inspector. When there is resentment at the visit of an inspector, there is usually something wrong in the store. The inspectors of the Board of Pharmacy of this State have instructions to treat every pharmacist with the utmost courtesy, but they are also instructed that they must insist upon obtaining the information which will enable the Board to determine whether or not the pharmacy inspected is being conducted in a lawful manner.

Section 6 brings us to the regulations governing the sale of poisons. Important points to be observed in this connection are the following:

Poisons may not be sold to any minor under twelve years of age nor to any persons known to be of unsound mind or under the influence of liquor. In the sale of any poison, it is the duty of the pharmacist who makes the sale or who supervises the sale to satisfy himself that the poison is being purchased for a legitimate purpose. The law states that "before delivery shall be made, the seller must learn by inquiry that the person to whom delivery is made is aware of the dangerous character of the poison and is a proper person to purchase such poison." Note particularly that the law says that the seller must learn these things *by inquiry.* He is not expected to assume anything.

In all cases of sales of poisons, the name of the article in English, the word "Poison" and the name and place of business of the dispenser must appear on a red label affixed to the package, bottle, box, can, container or wrapper in which the poison is contained.

There has always been some argument as to what constitutes the container. Lawyers may quibble about such a question when they are endeavoring to extricate a client from a difficult position, but to us, as pharmacists, there certainly should be no question as to what is the container of the poison. If a bottle of tincture of iodine is sold and the unlabeled bottle is wrapped in paper and the label is placed on the wrapper, no one could maintain in good faith that the container of the tincture of iodine is labeled. The wrapping paper is not the container of the tincture of iodine. The bottle is the container. Therefore, it is the bottle which must be labeled.

Not long ago a prescription for a poisonous preparation was filled in one of our pharmacies, and the prescription was delivered in a dropper bottle inserted into a pasteboard carton. The carton bore the label of the prescription with the physician's directions. The bottle itself was not labeled. Perhaps under very fortuitous circumstances a lawyer might succeed in convincing a judge or a jury that this pharmacist had labeled the prescription properly, but no one in this audience would concede that this was a safe and proper method of labeling this prescription. It is easily conceivable that there might have been two such bottles of the same size but differing in contents for different members of the family and that the cartons might have been mislaid or that even the bottles belonging to the respective cartons might have been switched. The potentialities for harm in such a situation are so great that the pharmacist's responsibility in this matter of labeling is certainly clear. It is not merely a question of complying with the letter of the law. It is a matter of rendering a professional service to the patient which is here involved. That service is not properly rendered when the pharmacist fails to take every possible precaution to avoid accidents which may result through carelessness or false economy in this important matter of labeling poisons and any other type of drug or medicine.

Poisons which are destructive to adult human life in doses of five grains or less, when sold over the counter must be recorded in a poison record which, in turn, must be kept on hand for a period of at least five years following the date of the last entry. This poison record shall at all times be open to the inspection of any member or agent of the Board of Pharmacy, or to any proper officer of the law.

It is not compulsory, under the Pharmacy Act, to print antidotes for poisons upon labels, but it is wise to do so. There are other laws

governing the sales of certain poisons which require the presence of antidotes upon labels, and these laws must, of course, be observed. Poisons which are sold upon the prescription of physicians, dentists or veterinarians need not be registered in the poison register, but must be kept on file for a period of at least five years.

You are familiar with the two schedules of poisons listed in the Pharmacy Act. Schedule A, you will recall, includes all poisons which must be recorded in the poison register when they are sold. Schedule B includes poisons which need not be recorded in the poison register when sold. With the exception of the registration feature, the sales of all poisons must be handled exactly alike.

Section 7 of the Pharmacy Act makes it unlawful for any person to conduct a pharmacy unless he is a registered pharmacist. This section also makes it unlawful for anyone to act as a manager or clerk or assistant or apprentice unless he is registered in one of these classifications with the Board of Pharmacy.

This section also makes it unlawful for anyone to adulterate or sell any adulterated drug, medicine or chemical. Procuring, or attempting to procure, registration for himself or any other person by making false or fraudulent representations is also a violation of the Pharmacy Law under this section. Section 7 also prescribes penalties for violations of the Pharmacy Act. These penalties are not less than twenty-five dollars nor more than fifty dollars for the first offense; not less than fifty dollars nor more than one hundred dollars for the second offense; and not less than one hundred dollars for the third and each subsequent offense.

Section 8 provides that any justice of the peace in the county, or any District Court in the city, where offenses against the Pharmacy Law have been committed shall have authority and jurisdiction to hear and determine actions brought against alleged violators of the Pharmacy Law. These court officers have the right to render judgments with costs, and executions may be issued, after judgments have been rendered, against the goods and chattels of the defendant, and in default of sufficient goods and chattels to pay the judgment and costs, then the execution may be issued against the body of the defendant. This means, of course, that anyone who is found guilty of violating the Pharmacy Law by a proper court must pay a penalty for the violation committed. If the penalty is not paid, then execution may be issued against the goods and chattels of the defendant, and if

sufficient money is not realized in such an action to pay the fine, it is then necessary to impose a jail sentence.

Section 9 of the Pharmacy Law includes several unfortunate provisos. A good part of this Section could well be eliminated from the Pharmacy Act in the interest of more effective enforcement. However, this section is in the Act and must be given the same consideration which we give to any other section. It provides, among other things, that nothing in the Act shall be so construed as to apply to or in any manner interfere with the making and vending of non-poisonous patent or proprietary medicines, nor with the sale of simple non-poisonous domestic remedies by retail dealers in rural districts, nor with the ownership of any pharmacy, in whole or in part, by any person who is not a registered pharmacist, provided that such pharmacy shall be at all times in charge of a registered pharmacist.

I have purposely left consideration of Sections 1 and 3 to the last. Section 1 creates the Board of Pharmacy and outlines the qualifications for membership on the Board. Those who will receive their certificates of registration today will not be personally interested in these requirements for a period of at least five years, because the law provides that members of the Board of Pharmacy shall be chosen by the Governor from among the able and skilled pharmacists of New Jersey who are not teachers and who have been registered as pharmacists in New Jersey for at least five years prior to appointment. Those of you who are ambitious and looking for a thankless job might bear in mind that in addition to being registered at least five years, the prospective member of the Board of Pharmacy must actually be engaged in conducting a pharmacy at the time of his appointment and continue in the practice of pharmacy during the term of his office. The appointment is for a five-year period, and is made by the Governor from a list of three names sent to him by the New Jersey Pharmaceutical Association. The Governor is not compelled to make his appointment from this list, but it is a fact of which the New Jersey Pharmaceutical Association may well be proud that in the sixty years of its history, no Governor has ever ignored the recommendations of the New Jersey Pharmaceutical Association. It may also be well for the prospective Board members to bear in mind that an oath of allegiance to the United States and to the State of New Jersey must be taken by each member of the Board, and that the Governor may remove a member of the Board on proven charges of inefficiency, incompetency, immorality or professional misconduct.

Section 3 empowers the Board of Pharmacy to organize by electing a president, a secretary and a treasurer, and to make by-laws and rules for the proper fulfillment of its duties. It authorizes the Board to conduct examinations and compels it to keep a book of registration in which shall be entered the names of all persons who become registered as pharmacists. It requires the Board to make an annual report to the Governor and to the New Jersey Pharmaceutical Association upon the condition of pharmacy in this State. It also provides for the compensation of the officers and members of the Board, and for the disposal of funds collected.

It may be well to point out that the Board of Pharmacy, as well as other profesional Boards in this State, have, for years, conducted their affairs with the health and welfare of the public in mind as the first consideration. The income of the Board of Pharmacy is derived from examination and registration fees and from the penalties for violations of the Pharmacy Act. Not a penny of income is derived from the State Treasury and none of it comes from the pockets of the taxpayers. The Legislature created the Board of Pharmacy and other professional Boards to meet the need for regulating the practice of the various professions in this State. The funds which the Board of Pharmacy expends in enforcing the Pharmacy Law come directly from the members of the profession, or prospective members of the profession. The comparatively small amount obtained in the way of penalties from persons outside of pharmacy who violate the law, constitutes the only exception to that statement.

You will note from the provisions of our Pharmacy Law and other laws regulating the various professions that it has been an accepted policy in this State to depend upon the various professions to formulate their own standards and enforce proper regulations. This is as it should be, for no standards are more exacting and of greater benefit in protecting the public than the standards which the professions have set for themselves in their respective codes of ethics.

Laws which appear finally on our statute books are usually the result of compromise between principle and expediency. Codes of ethics which have been set up by the professions as rules of conduct for their members make no sacrifice to expediency.

Pharmacy has its Code of Ethics, and if you abide by its provisions, as you should, you will never have cause to worry about what the world at large may think of you. It is a code of which every pharmacist may be proud. For your benefit it has been printed

on today's program, and if you believe in it and desire to observe it, we shall be most happy to have you endorse it by your signature.

Justice Brandeis of the U. S. Supreme Court has said that a profession is distinguished from a trade by the following: 1. A profession requires a preliminary training that is intellectual in character and the achievement of a measure of learning as distinguished from mere skill that may be acquired by experience. 2. A profession is not supposed to be pursued merely for one's self. 3. A profession is not supposed to measure the success of its members by the amount of their financial returns.

Edward A. Ross, in discussing the same subject, stated that a profession is characterized by the following: 1. A profession must have a code of ethics. 2. A profession must have machinery for enforcement of its code of ethics. 3. A profession must have a literature. 4. A profession must have affiliations with educational institutions. 5. A profession must have organization.

You know enough about pharmacy and its structure to realize that pharmacists can well qualify as members of a profession under any of the requirements suggested above.

We like to dream about the professional aspects of our calling, but sometimes when we are faced with the cold realities of making a living out of the profession, the ideals of which we dream appear very far away. Contrast the picture of "The Druggist" which has recently been displayed in many pharmacies—I mean the picture of the apothecary called out in the middle of the night to fill a prescription intended to restore to health some ailing child, with the anxious family at the bedside awaiting the return of the youth who sits at the side of the pharmacist as the prescription is compounded by the light of an oil lamp—contrast this, I say, with the hurly burly, everyday merchandising activity of the average drug store. If you are inclined to be cynical you may ask "How often do we get a chance to practice this profession?" But have you ever watched a physician or a lawyer or a preacher at work? The comparatively short time spent by the physician in the operating room, the clergyman in his pulpit and the lawyer at the bar correspond to the momentary thrill which you will get when you compound a difficult prescription to aid some sick child. The digging for precedents and points of law in musty tomes and legal volumes on the part of the lawyer; the monotonous attendance upon socials and ladies-aid meetings which is a part of the routine activity of every preacher; and listening to the description

of the aches and pains of the average run of patients, which of necessity constitutes a large part of the physician's daily task, are all comparable to what we call the daily grind of the drug store. No profession has a monopoly of thrills and self-sacrificing service; so let us not become discouraged if the hard work and sacrifice which are represented in the achievement of your certificate of registration do not lead at once to a part in the play of life which corresponds to that of the leading man or the hero. The important thing is to be ready to act the part when the opportunity comes.

THE NIGHTSHADE GATHERERS—RHIZOTOMI

By Fred B. Kilmer, Ph. M.

OUT OF THE SHADES of antiquity there come inklings of a class of men who devoted themselves to the calling of gathering and preparing roots and herbs to be used in medicine. Their name "Rhizotomi" indicates that the roots of medicinal plants filled a prominent place in prehistoric materia medica.

Fragments of the story of these men that come down to us show that while they mixed magic with their medicine they were not superstitious fakirs. These root gatherers carried on their labors under a ritual of prayers and incantations which were to be said or sung at the time of the plucking, digging, preparation and preservation of the drug for use. A feature of their method was the careful cleansing, cutting and slicing of the roots. Scrupulous care was taken against "corruption" by fermentation or mold, with due regard to storage.

In some instances, the plants were gathered and prepared for the cure of a particular person or patient, and the individual's name and his disease were incorporated in the incantation. The root gatherer anointed himself with "new oil," when about to gather acrid or poisonous herbs. He put on a clean garment, carried implements either of bone, ivory or iron with which to dig, a clean pot or cloth in which to place the herb. He prepared himself as religiously to gather roots as would the ancient priest before he went into the sacred places of the temple.

Some of these herb gatherers of antiquity were men who investigated drug plants in a rational scientific manner. Some of their traditions were known to Theophrastus, who recorded that one Thrasyas, who systematically investigated the properties of plants, elaborated the idea that the action of such plants as the narcotic nightshades depended upon the temperament of the individual to whom it was administered, acting as a poison or as a beneficent medicine (soporific). To Thrasyas is credited the discovery of compounding plant poisons that would bring on a speedy and painless death. The nature of this compound is unknown. Thrasyas and his colleagues were prehistoric pharmacologists of the most heroic type; they deliberately experimented in searching out poisonous drugs, testing upon their own persons the effects of drastic and poisonous substances. They demonstrated that the human system became im-

mune or habituated to the effects of drugs. They likewise devised antidotes for poisonous drugs. In their experiments they used their own stomachs as test tubes; they would administer a poisonous drug such as hyoscyamus or the mandrake and follow this with a dose of the antidote.

In preparing medicinal plant roots, a notable feature of these ancient gatherers' work was that the root was cut into very thin sections and (usually) dried in the sun. The sections were so thin that the record gives directions for "rubbing to a powder between the fingers."

All honor to these men of magic, the "root gatherers" of prehistoric times, who, under flickering rays, laid the foundation of pharmacognosy.

Nightshade Peddlers

From the days of the Nomad down to now, over the highways and the byways of the globe have plodded the itinerant vendors of medicines. They appeared among the medicine men of the savage tribes; they were numbered among the wandering specialists of ancient Egypt and Babylon. Out of Arabia they came in hordes. From the beginning, they were in Greece and Rome; in the Middle Ages they were at times the only source for medical aid. In the later centuries, they flourished in England and in European lands; all over the earth, even in our time, we have the peripatetic medicine man—the strolling herbalist.

This picturesque class have ever formed the central theme for the satirist, the painter, the dramatist, the etcher, and the humorist, and find a place with the hack-writer and the cartoonist of the present time.

William Clowes, in the time of Queen Elizabeth, in vigorous language rated them as "renegades and vagabonds" stating that in their ranks might be found "tinkers, peddlers, ostlers, horse gelders, idiots, bawds, witches, conjurors, soothsayers, rogues, rat catchers, and proctors of spittle houses."

It is also true that in the ranks of the herb doctors have been found physicians, botanists, and men of character and learning. Among these men were the investigators and pioneers who helped to lay the foundations of medicine, surgery, dentistry, materia medica, chemistry, pharmacy, therapy and allied arts. In their labors (carried out in many lands) we find the beginning of our knowledge of

many medicinal plants, among which digitalis, coca and cinchona may be cited as familiar examples.

From the "herb doctors," savage and civilized, have come the important drugs that fill the lists of material medica of the American continent.

The narcotic nightshades have ever held a place among the herb sellers. In the first records of traffic in drugs appear the mandrake and the henbanes; through the herbalists who accompanied the Arabian caravans and the Crusaders, the Daturas were carried into Europe. The belladonna is reputed to have spread from Italy and the Levant into the North, through the aid of the strolling herb traders. The navigators to the Americas learned of the Jimson weed through the savage herbalists.

We are not to infer that the deadly nightshades were in common use as were the milder, safer herbs. The records show, however, that these plants, though poisonous, formed a part of the herbalist's knowledge and were a part of his wares.

It was the strolling herbalist who kept alive the magic powers of the mandrake. It was they who gave to the other nightshades their mystic halo. The narcotic nightshades formed a part of the ointment, salves, plasters and poultices of the herbalists. The pain dispelling power of the narcotic nightshades appears in the pile cures, cancer cures, asthma cures and in the pain-killing compounds through the ages. Some of the most noted nostrums held these drugs in their compound.

In ancient Egypt, hyoscyamus was steeped in oil and used as a toothache cure. This sort of a compound still survives. The Baume Tranquille of the Capuchin monks was an oily infusion of drugs which included hyoscyamus. In modified form this mixture runs through the pharmacopœias down to the National Formulary of 1926.

The inhalation of the vapor of stramonium goes back to the primitive times; it was an ingredient in the famous vapor cure of St. John Long and formed a part of the world-wide inhaling compounds.

In the eighteenth century appeared a gout cure that attained great fame, the "Eau Medicinale D'Husson;" while the base of this mixture was colchicum, hyoscyamus was used in it as an anodyne. From Italy came wafers containing belladonna used as beautifiers.

Laws that regulate the sale of poisonous drugs have not stopped the traffic in the narcotic nightshades.

In India, the baskets of dealers squatted in the market carry stramonium seeds; in the village markets of Europe there is still a sale for the mandrake (usually bryony root). In our own land there is a traffic in Jimson weed to be used in smoking "for the nerves." The Duboisia is traded in Australia, as is tobacco in other lands. In the sidewalk markets of Philadelphia, one can buy many sorts of plants under the name "deadly nightshade."

Whatever may be said of these herb doctors, history records the striking fact that their potions "cured" (actually cured!) their ailing patients.

The narcotic nightshades quieted pain, produced sleep, and the sufferers awoke refreshed and cured.

Perhaps poor human kind, so prone to dose himself, might not be the gainer if he obtained his sedatives, hypnotics, soporifics, and analgesics from the "nightshade peddlers" instead of the deadly "tar barrel."

THE AMERICAN MANUFACTURE OF QUININE SULPHATE*

By Joseph W. England.

THE MOVEMENT recently started in Paris by a committee of members of the Academy of Science, the Academy of Medicine, the Institute of Paris, the Provident Society, and the Society of Pharmacy to honor the memory of the discoverers of quinine by the erection of a monument to them in Paris, is one that deserves the hearty support not only of pharmacists, but also of the general public, whose sick have been saved untold suffering through the clinical use of quinine. It is not proposed in this paper to invite subscriptions for the monument through the Philadelphia College of Pharmacy, which has been requested by the Parisian committee to act in its behalf in this country. This request was made in the November (1897) ALUMNI REPORT, and doubtless the way is still open to those who wish to contribute, although a report has been made to the Parisian Committee by Prof. Henry Trimble on behalf of the college, for which he was elected to act.

What the writer wishes to dwell upon, are the thoughts suggested by the movement along a line that has a direct interest to us as Americans, and that is, the origin and growth of the American quinine industry, and the difficulties with which it has had to contend in its development.

At the writer's suggestion and request, Alexander H. Jones, of Powers & Weightman, the widely-known manufacturers of chemicals, of Philadelphia, has endeavored to ascertain as clearly and definitely as possible when the manufacture of American sulphate of quinine was first established, and obligations to him are here expressed for the very considerable trouble he has taken.

His letter is as follows:

JOSEPH W. ENGLAND,

EDITOR OF ALUMNI REPORT.

Dear Sir:—I have your esteemed favor of 6th inst. and am very much obliged to you for what you have offered to do.

We would have you say that in compliance with your request, we have carefully examined books and letters going back

*Reprinted from the Alumni Report of the Philadelphia College of Pharmacy and Science, March, 1898. Of especial interest in connection with the tercentary of Cinchona recently celebrated at the Missouri Botanical Gardens.

as far as 1818, this being the date when Messrs. Farr & Kunzi founded our business.

We find that in 1823 the manufacture of sulphate quinine by Messrs. Farr & Kunzi was fairly established, as the order-books and letters indicate a demand for the article, satisfactory and assuring. The quantities ordered at that time, as naturally would be expected, were quite moderate, usually a few ounces at a time, sometimes only a single ounce, occasionally a fraction of an ounce.

The figures representing prices, we would say were $16.00 per ounce, the sales-books of 1823 showing: $16.00 per ounce, $8.00 per half ounce, and $3.00 for an eighth-ounce (or $24.00 per oz.). We mention this price, $24.00 per ounce, because it has sometimes been referred to as the price at which Messrs. Farr & Kunzi charged quinine when they first manufactured the article. This can hardly be said to be correct; $16.00 may be taken as the price when taken half-ounce or more at a time. In larger lots in the latter part of 1823, say in October, the price might be said to have been $15.00 per ounce, that is when taken in lots of several ounces. In the early part of 1824 the price seems to have been about $15.00 by the single ounce, and in lots of several ounces say $13.50, then $13.00; so that I should say $16.00 per ounce in the early part of 1823, and $15.00 per ounce in the early part of 1824.

The manufacture of sulphate quinine in the United States commenced, as you will observe, soon after Pelletier & Caventou made known the result of their experiments, which was in 1820.

At first the French article was preferred, but eventually general preference was given the article made in the United States.

The manufacture of quinine became an important industry in the United States and the quantity manufactured was very large, and for purity and general appearance enjoyed a decided preference in this country for many years. The adverse legislation in 1879 in this country, however, very seriously crippled the American manufacturers and for years past the foreign article has flooded this market, especially quinine of German manufacture, cheap labor giving them great advantage. The German manufacturers now control about three-fourths of the quinine sold in the United States, whereas, prior to 1879, almost all of the quinine sold in the United States was of American production.

Very truly yours,

A. H. Jones.

Philadelphia, January 8, 1898.

It was a remarkable exhibition of American enterprise that the manufacture of quinine sulphate should have been established by Farr & Kunzie—now Powers & Weightman—in Philadelphia, within three years after its discovery in Paris, especially in view of the fact that few then recognized the pre-eminent place that the alkaloidal salt was destined to obtain in the then future of medical practice.

It is interesting to recall that in a paper read by John Farr before the Philadelphia College of Pharmacy, at a meeting held December 27, 1825, on the subject of "Extract of Quinine" (*Proceedings of the Philadelphia College of Pharmacy*—later the *American Journal of Pharmacy*—Vol. 1, No. 2, p. 43), the following statement is made:

> "In the summer and autumn of 1823, a season peculiarly memorable to Philadelphians by reason of the alarming prevalence of intermittent and other fevers, the sulphate of quinine was first successfully prepared here."

By whom it was prepared, Mr. Farr, who was a member of the firm of Farr & Kunzie, did not state, obviously for personal reasons, but Mr. Jones, in the letter given above, points out that to the firm referred is due the credit for first establishing the commercial manufacture of quinine sulphate in this country.

Sulphate of quinine was manufactured in Philadelphia by George D. Rosengarten, the founder of the present house of Rosengarten & Sons, in 1824.

In a pamphlet issued by Howards & Sons, of London, on January 29, 1898, giving the history of the firm from its founding in 1797, to 1897, it is stated, among other matters of historical interest, that:

> "It was not long after the discovery of quinine by Pelletier, and Caventou, in 1820, that the sulphate of the alkaloid established its place in medicine, and its manufacture was taken up at Stratford (in the city mills of Howards & Sons). At first it was considered as of no great importance, and, in fact, it is now impossible to fix the date of the first commencement of the manufacture which has been associated all over the world with the name of Howard. It appears to have been about 1827, but it was not long before the demand for quinine led to its manufacture on a scale which was then thought very remarkable, though a thousand ounces then probably struck the imagination more than the million and a half ounces contained in the bark offered in one sale in Amsterdam the other day."

As a matter of history, regarding the early manufacture of quinine sulphate in France, it may be of interest to quote the following, from the *Revue Médicale,* May, 1827, *vide North American Medical and Surgical Journal,* October, 1827, 434, *vide Journal of the Philadelphia College of Pharmacy* (later the *American Journal of Pharmacy*), 1827, 98:

> "MM. Pelletier and Caventou have applied to the French Academy to be allowed to become applicants for the Monthyon Prize, in consideration of the medical improvements which have grown out of their discovery of quinia and its sulphate. They state that in consequence of their labors, the preparation of the sulphate of quinia has become a new branch of industry in France of the highest interest. To give an idea of the quantity of this sulphate which is annually consumed they laid before the Academy a statement of the amount manufactured in two laboratories in Paris, one conducted by M. Pelletier, and the other by M. Levaillant. This document embraced the following particulars:

Cinchona bark treated by M. Pelletier on his account,	270	quintals*
Cinchona bark treated by M. Pelletier in conjunction with M. Delondre	460	"
Cinchona bark treated by M. Levaillant, for M. Delondre	420	"
Cinchona bark treated by M. Levaillant, for himself and various capitalists	437	"
	1587	"
This quantity of cinchona produced of sulphate of quinia	59,000	ounces
The other manufacturers of France are estimated to furnish	31,000	"
	90,000	"

> "MM. Pelletier and Caventou add that their details will not appear exaggerated when it is considered that the sulphate of quinia is employed over the whole of Europe, that it is exported to America, and that French and English commerce conveys it to the Levant and East Indies."

The lowest and highest price of American quinine sulphate for each year from 1823 up to 1897, inclusive, is a matter of interest, and is here given. The data from 1823 to 1853, inclusive, is that

*The quintal contains about 100 pounds.

furnished by Samuel F. Troth, in a paper read at the Pharmaceutical Meeting of the Philadelphia College of Pharmacy, held February 18, 1879 (*A. J. P.*, 1879, 156), from records kept by the firm of Henry Troth & Co., one time wholesale druggists of Philadelphia. The prices since that date have been kindly furnished by Harry B. Rosengarten, of Rosengarten & Sons, the well-known manufacturers of chemicals, of this city. It should be added, that the prices given are for one-ounce vials, inclusive, and that "bulk" prices have been, for some years past, 7 cents an ounce lower than those quoted.

For many years after the quinine industry was started, it continued to develop with the country's development, until new factors in quinine-making appeared. The first was the change of the source of bark-supply. Originally, and up to 1840, Calisaya bark was the only bark used for quinine. It was all brought to this country from Bolivia, where it was under the monopoly of the Government, whose only agents were Alsop & Co., of New York, who supplied both Europe and the United States. The foreign manufacturers came to New York to buy their supplies of bark.

After the discovery of barks suitable for the production of quinine, in other parts of South America, the whole trade changed. Calisaya bark sold at one time as high as $1.75 a pound. When barks were brought from Ecuador and Colombia, they were shipped to Europe as well as to this country, and the price fell as the supply increased. When Calisaya bark came exclusively to New York, the American manufacturers exported some quinine to Europe, where it competed successfully with the foreign-made. This ended when the other South American barks were shipped abroad.

In 1867 Cinchona bark from the Indian plantations began to be brought into the London market (*Pharmacographia,* 1879, 351). In 1869 the first export of Ceylon bark was made (*Tropical Agriculturist,* of Colombo, Ceylon, 1884, pp. 379-383, *vide* the *Pharmacist,* vol. xix, 1). In 1869 the first shipment from Java was made (U. S. D., 1894, 388).

Year.	Lowest and Highest Prices of American Quinine Sulphate. Per Oz.	Year.	Lowest and Highest Prices of American Quinine Sulphate. Per Oz.	Year.	Lowest and Highest Prices of American Quinine Sulphate. Per Oz.
1823	$16.00–$20.00	1848	$2.60–$2.70	1873	$2.45 –$2.55
1824	12.00– 14.00	1849	2.95– 3.65	1874	2.20 – 2.50
1825	8.00– 8.00	1850	3.70– 3.70	1875	2.15 – 2.30
1826	5.25– 7.00	1851	3.25– 3.25	1876	2.20 – 2.70
1827	6.00– 7.50	1852	2.80– 3.00	1877	2.70 – 4.50
1828	3.25– 6.00	1853	2.70– 3.20	1878	3.40 – 3.60
1829	2.25– 2.90	1854	2.50– 2.50	1879	2.60 – 3.60
1830	1.75– 2.50	1855	2.60– 3.00	1880	2.25 – 3.25
1831	1.35– 1.50	1856	2.40– 2.60	1881	1.90 – 3.25
1832	1.75– 2.00	1857	1.40– 2.00	1882	1.80 – 2.50
1833	1.70– 1.87	1858	1.25– 1.40	1883	1.60 – 1.80
1834	1.25– 1.80	1859	1.25– 1.50	1884	.90 – 1.80
1835	1.60– 1.65	1860	1.20– 1.80	1885	.75 – 1.00
1836	1.45– 1.58	1861	1.80– 2.10	1886	.65 – .80
1837	1.40– 1.40	1862	2.25– 2.90	1887	.46 – .70
1838	1.60– 1.90	1863	2.70– 3.25	1888	.47 – .56
1839	2.75– 3.30	1864	2.60– 3.75	1889	.39 – .45
1840	2.87– 3.12	1865	2.20– 3.40	1890	.39 – .42
1841	2.50– 2.62	1866	2.25– 2.60	1891	.31 – .37
1842	1.60– 2.00	1867	1.95– 2.20	1892	.27 – .31
1843	1.55– 1.80	1868	1.90– 2.35	1893	.29 – .32
1844	2.00– 3.00	1869	2.00– 2.30	1894	.34.5–
1845	2.35– 2.40	1870	2.00– 2.30	1895	.34.5– .37
1846	2.20– 2.40	1871	2.20– 2.45	1896	.27 – .34.5
1847	2.30– 2.40	1872	2.40– 2.45	1897	.24 – .37

The work that led up to the production of cultivated barks is interestingly told in the pamphlet of Howards & Sons, previously referred to. It reads as follows:

> "The ever-growing importance of quinine in medicine rendered it more and more difficult to obtain an adequate supply of cinchona bark. The calisaya and officinalis barks, which first gained renown, were supplemented by Pitayo, soft Columbian, Carthagena, and later by the Cuprea barks, and yet the supply was inadequate, and the price of quinine, notwithstanding the greatly increased yield obtained by improved processes, steadily advanced. The Indian Government, in view of the immense importance of ensuring a supply of quinine, took the matter in hand and sent expeditions into the bark-producing districts of South America to obtain cuttings or seeds of the cinchona. The difficulties were very great, chiefly from the hostility of the native Indians, who most jealously guarded their monopoly of this precious drug, and who had succeeded in thwarting the previous efforts to obtain them. The Dutch had, indeed, obtained a collection of plants, but when they reached Java and were cultivated, they proved to be of inferior and practical valueless species.
>
> "The British Government, owing to the indomitable courage and skill of Mr. Clements R. Markham, and his assistants,

Messrs. Spruce, Pritchett, Weers and Cross, were more successful, and after most romantic adventures succeeded in bringing to Europe plants of succirubra and officinalis barks, and some inferior varieties of calisaya. The Stratford firm had taken the keenest interest in this endeavor, and the assistance given by Mr. John Eliot Howard was of great value. The plants of the finest variety of the cinchona officinalis were in a very sickly state, and were most carefully nursed and propagated in his hot houses, and from one of these plants all the richest Crown barks in India and Ceylon were derived. By far the greatest success in cultivating the cinchona barks in India was obtained with the *C. Succirubra,* which contains not only quinine, but also large quantities of cinchonidine. The assistance of the Stratford firm was therefore called in to prepare large quantities of the various cinchona alkaloids in a state of purity, and their therapeutic value determined by most careful trials made by a commission of doctors in India; the high value of quinidine, cinchonidine and cinchonine was thus established. Mr. John Eliot Howard was able to give even more substantial aid to cinchona cultivation by introducing Mr. Charles Ledger to the Indian and Dutch Governments, who had obtained a supply of the seed of very finest calisaya bark from an Indian cascarillero named Manuel. The Indian Government gardens were not very successful in cultivating this, but the Java plantations made so good a use of it that the vast supplies of bark from Java in 1897 were entirely derived from the packet of seed obtained from Mr. Ledger, which it is sad to know cost poor Manuel his life, for on his return home he was murdered by the jealous Indians.

"The enormous alterations in price and quantity of quinine manufactured, that have been brought about by the substitution of cultivated for native-grown bark, are but one example of the changes that have come over the manufacture of medicinal chemicals since the Stratford business began. The hundreds of ounces of actual production of earlier days grew into thousands, and have now to be counted by hundreds of thousands, while the price has varied from a guinea an ounce of early days to the minimum of 7½ *d.* last spring. The firm has, however, been able to adapt itself to altered conditions, and by carrying on the old principles of the founders, has maintained throughout the position gained by them. . . . In some directions it is true that their operations are grievously hindered by the disadvantages under which English manufacturers work, especially with regard to the free use of alcohol as allowed in Germany, and to the freedom of experimental physiology which has enabled our German friends to work out the application of synthetic remedies. Where, however, their hands have not been fettered by fiscal or sentimental legislation, they have not failed to profit by scientific progress."

The increment in quinine-content of the cultivated barks over the uncultivated has been remarkable. Where the percentage of quinine in uncultivated barks ran at one time about 1 per cent., cultivated barks may be had today which run over 5 per cent., as the following abstract from editorial in *The Chemist and Druggist,* January 29, 1898, 163, shows:

"The quantity of quinine in the cinchona-bark offered at the ten Amsterdam auctions of 1897 fell considerably below that offered in 1896, and would, indeed have carried us back to the figures for 1895 but for the huge supplies offered at the December sales. Weight for weight, the supplies of bark actually fell below those for 1895 as well as of 1896, but it is too often forgotten, in speculating upon the future of the bark-supply, that while the output of the Island of Java is falling, the alkaloidal richness of the bark continues to rise. Thus the average richness (in quinine) of the Java manufacturing bark in 1897 shows an increase of nearly 5 per cent. on that of the year before, and of over 43 per cent. since 1889. The actual average unit for each year, and its percentage increase upon its predecessor during the past seven years are shown in the following table:

	1891	1892	1893	1894	1895	1896	1897
Average unit per cent....	4.08	4.50	4.60	4.93	5.01	5.48	5.73
Per cent. increase on the year before	2	10	2	7	2	9	5

"From the bottom line it will be noticed that the average unit has generally taken a big step forward every second year. If this tendency be maintained in the same ratio during the twelve-month just commenced, the average quinine-content of the manufacturing bark offered at Amsterdam this year will be over 6 per cent. Hitherto such a unit has only been attained in the auctions of August and September, 1897, and a few years ago it would have been looked upon as wildly improbable."

The largely increased supplies of bark, with their largely increased quinine-content, has resulted in excessive quinine production abroad, has greatly cheapened the price of quinine all over the world. Since 1879, however, the United States has been made the dumping-ground of Europe's excess of product, so that, as shown by Mr. Jones, in his letter given above, about 25 per cent. of the quinine here sold is home-made, while about 75 per cent. is foreign; formerly almost the whole amount sold was of domestic production. This change

has been made possible by the adverse legislation of 1879, when the 20 per cent. import duty on quinine was repealed, and quinine was made duty free.

The tariff changes which have taken place in bark and quinine in the United States are here given. From 1823 to 1842 quinine sulphate was dutiable at the rate of 15 per cent. On August 30, 1842, the rate of duty was made 40 cents an ounce, which continued until July 30, 1846, when it was changed to 20 per cent. and bark, which had been previously free of duty, was burdened with a duty of 15 per cent. This condition of affairs continued until March 3, 1857, when the duty on quinine sulphate was reduced to 15 per cent., and bark was made duty free.

In 1861 there were two changes made. On March 2, 20 per cent. was the duty placed on quinine sulphate and 10 per cent. on the bark, while on August 5 the former was increased to 30 per cent., and the latter to 15 per cent.

In 1862 there was another advance. On July 14 the duty on the sulphate was placed at 45 per cent., and that on the bark at 20 per cent. The rate for the bark continued until 1870, when it was made free of duty.

On June 6, 1872, the duty on quinine was reduced to 20 per cent., and on July 1, 1879, was made free of duty, and has been kept so ever since.

On June 22, 1874, a duty was imposed on East Indian bark in this way: East Indian bark was made dutiable under the "Cape of Good Hope Discriminating Duty Act," which took in bark as well as anything else, but not especially bark produced east of the Cape of Good Hope, and sold west of the Cape of Good Hope. Under this law, bark brought directly to this country from points east of the Cape of Good Hope had free entry, but when sold in the Amsterdam and London markets it was dutiable at 10 per cent. But this law was not passed with special reference to bark. The law was repealed on May 6, 1882, the act to take effect January 1, 1883.

The accompanying table tells an interesting story of the imports of cinchona bark and its products into the United States for the past thirty-one years. The writer is indebted to the Bureau of Statistics, U. S. Treasury Department, Washington, D. C., for the figures with which he framed the table.

Analysis of this table will reveal a number of striking facts, but the one that emphasizes itself most is this: "In the fiscal year ending June 30, 1897, the amount of quinine sulphate imported was 2,714,-

Fiscal Year ending June 30—	Imports of Barks containing Quinine. Pounds.	Value.	Imports of Quinine Sulphate (includes, up to 1874, "Other Salts of"). Ounces.	Value.	Imports of Cinchonidine (not enumerated until 1884). Ounces.	Value.	Imports of Cinchona Alkaloids, or Salts of, all other (included with "Quinine Sulphate" up to 1874). Ounces.	Value.
1867	—	$ 435,384.00	79,478	$ 89,195.00	—	—	—	—
1868	1,068,056	411,234.00	40,675	50,979.00	—	—	—	—
1869	1,559,431	483,567.00	117,996	111,886.00	—	—	—	—
1870	1,490,085	399,496.95	37,550.50	36,767.97	—	—	—	—
1871	{ — 286,095	580,248.00 117,299.00 }	10,861	12,261.00	—	—	—	—
1872	2,852,841	982,674.00	34,723	32,645.00	—	—	—	—
1873	4,438,935	942,506.18	{ 7,970 114,814	12,521.00 208,828.00	— —	—	—	—
1874	5,140,500.25	1,265,597.00	68,097	125,510.00	—	—	569	$ 768.00
1875	4,520,390	888,762.00	12,279	17,491.00	—	—	1,427.75	2,226.00
1876	5,280,150	1,102,203.00	22,746	31,117.00	—	—	1,413	2,046.00
1877	1,760,446	443,404.00	75,804	236,948.55	—	—	681	1,089.00
1878	4,826,290	1,423,502.00	17,549	50,858.00	—	—	98.80	434.74
1879	6,389,378	2,094,514.00	228,348	626,567.00	—	—	617	755.00
1880	6,013,877	1,679,472.00	416,998	1,111,254.00	—	—	406	720.00
1881	4,219,403	1,846,280.00	408,851	1,052,228.00	—	—	* —	* —
1882	5,010,547	1,846,375.00	794,495	1,554,349.50	—	—	392	1,388.00
1883	3,639,315	1,205,606.00	1,055,764	1,809,797.67	—	—	97	248.00
1884	2,588,307	718,035.00	1,263,732	1,610,163.30	381,885	$206,405.00	712	1,038.00
1885	2,559,691	913,189.00	1,390,126	1,292,794.00	478,747	220,846.00	5,435	1,868.00
1886	4,447,082	925,744.00	1,251,556	887,599.00	449,414	56,699.00	131,747	15,509.00
1887	4,787,311	741,830.00	2,180,157	1,098,547.00	570,162	41,601.00	1,505	1,225.00
1888	2,801,457	344,717.80	1,603,936	647,654.00	609,576	28,883.00	6,226	2,763.00
1889	2,878,184	371,532.50	2,825,008	917,322.00	171,251	6,839.00	82,337	31,001.00
1890	2,838,306	282,737.00	2,990,239	886,430.00	106,829	5,379.00	53,115	13,980.00
1891	2,672,364	301,085.00	3,079,000	805,821.00	156,229	3,856.00	111,013	23,977.00
1892	3,423,941	299,998.00	2,686,677	542,440.00	11,483	1,586.00	156,442	29,366.00
1893	2,374,041	196,867.00	3,027,819	556,782.00	364,192	11,714.00	48,030	11,695.00
1894	2,502,224	143,194.00	2,141,130	470,816.00	313,640	7,177.00	40,850	10,991.00
1895	2,012,399	117,998.00	1,308,959	327,541.30	72,425	3,534.00	37,027	10,857.00
1896	2,699,789.5	165,699.00	2,950,078	754,050.00	282,321	9,980.00	76,507	23,147.00
1897	2,537,693	142,303.00	2,714,147	489,821.70	450,331	36,651.00	367,373	57,237.00

*None separately returned as imported in 1881.

147 ounces." The amount of domestic product sold is estimated to have been 900,000 ounces. It may be stated, also, that for the year ending December 31, 1897, the amount imported was 4,364,823 ounces! Formerly, almost all was made at home; now, about 25 per cent. is so made. The industry that took years to build up has fallen far short of its proper development.

The future of the American manufacture of quinine sulphate is a problem. At present there is little inducement to make it, and the question is, how can its manufacture be stimulated?

If the manufacturer could obtain with free bark a protective duty of 5 cents an ounce on quinine, he could probably battle effectually with his foreign competitors. But unfortunately the question of an import duty on foreign quinine has been made, for a number of years, a question of politics. The South and West, the larger users of quinine, have fought against the re-enactment of an import duty, and their votes have carried the day.

Unquestionably if the policy of protection to American industries be followed at all, it should be followed equally with all. In common justice, the industry of quinine-making should have the same measure of protection that any other industry in the country has. Unfortunately, however, the possibility of securing it seems most remote, if the history of our legislation since 1879 is any indication.

If it be impossible to obtain adequate protection, may it not be possible to put the industry upon a more successful basis through other means? The sociological conditions of the country will not permit, probably the cheap labor that obtains abroad—and forms an important factor in the cost of quinine-making—but is it not possible that cheaper labor may be had? Not by cheapening labor, but by educating labor so that larger results may be obtained from the same outlay? If the history of the marvellous growth of the German chemical industry of recent years teaches anything, it teaches the money-value of scientifically educated labor.

It is a well-known fact that some American manufacturers—notably in certain mechanical pursuits—can ship abroad goods made by high-priced American workmen, and successfully compete with foreign manufacturers having cheaply-paid workmen. Why? Because of the higher education of the American workmen along certain lines, and because the latter work with a different energy, and can turn out more work in a given time. Is it not reasonable to believe, then, that if American chemical manufacturers offered special inducements to the younger generation to take up the study of tech-

nical chemistry and make it their life-work, that a specially educated class of American workers could be secured, and the way would be opened by American energy for a great development of all branches of chemical industry in this country, so that, in time, it might come to command the markets of the world?

In this connection, the following, from the editorial page of the *Philadelphia Bulletin* (March 1, 1898), is of interest:

> "A study in the contemporary issue of the *Revue des Deux Mondes* throws some light on the value of continued education in the universities.
>
> "When Prussia electrified Europe by her military pre-eminence, the secret of her prowess was ascribed to the schoolmaster—that is, the superior education of the rank and file of her armies. But since 1870 all Germany has made an equally astounding advance industrially and commercially. The *Deux Mondes* writer ascribes this also to the better and more systematic education of the German colleges. For, whereas, the tendency here is to curtail the college course, in Germany new institutions are springing up all the time to supplement the six years' university course. These supplemental schools educate youth in practical sciences, and enable German manufacturers to undersell every other people in Europe. There are, for example, scores of institutions for the teaching of chemistry—the application of all that can be known of the alchemic forces of nature applicable to the production of matters used in the arts. The result is that Germany supplies the world with most of the articles hitherto manufactured in Britain and France, because education enables the artisan to do more cheaply and intelligently what is only imperfectly done elsewhere.
>
> "Hence from this example alone it is clear that too much money cannot be spent in education, provided the outlay is made in wisdom. In France the expenditure for education is enlarging all the time, and it is now proposed, in order to compete with Germany, to extend the college course and appropriate more money in both Great Britain and France. In a country like this the true results of an educational system cannot be judged from year to year. Even the comparative tables of illiteracy do not give the true value of the work carried on in colleges, technical institutions or even the normal schools. Before a people can rank in scholarship or attain the prodigies the world is wondering over in Germany, there must be a long term of average intelligence; that is, the common attainments that give tone and character to a society. After that is attained then comes the pre-eminence in special studies that for centuries signalized Germany and even France."

MEDICAL AND PHARMACEUTICAL NOTES

THALLIUM SULPHATE AS A RAT POISON—Experiments conducted in the pathological department of the Hawaiian Sugar Planters' Association on the relative toxicity of rat poisons indicate that thallium sulphate has most practical value. Captive rats refused to take barium cakes unless deprived of other food. Some rats appear to be less susceptible to strychnine poisoning than others, since they could eat unlimited quantities of wheat treated with this poison, although many others were killed by it. Wheat treated with thallium sulphate was found to be attractive bait, which was an efficient poison. It has now been generally adopted as a cheap and efficient rat poison in Hawaiian plantations. Almost complete cessation of rat damage has followed its use in infested areas. Such bait requires to be handled with care; skin absorption is avoided by the use of rubber gloves when handling the salt solution.—J. P. Martin (*Food Manufact.*, 1930, *5*, 126), through the *Pharm. Journ.*

CHOLESTEROL HAIR-LOTIONS AGAINST LOSS OF HAIR—Experimenting on the living organism, Professor Jaffe, Frankfort-on-Main, has proved that there is a connection between the assimilation of cholesterol and the growth of the hair. In cases where the loss of hair is due to disturbed function of the sebaceous glands, the application of cholesterol in the shape of a hair-lotion is indicated and promising. The formation of scurf usually disappears after about two weeks, but obstinate cases often require prolonged treatment. During the administration of cholesterol the hair should not be washed too frequently in order to avoid irritation of the sebaceous glands. The solution of the cholesterol for hair-lotions often presents difficulties. Ether, chloroform, fats, and essential oils, all good solvents for cholesterol, are out of the question for this special purpose. 94 to 95 per cent. alcohol dissolves at ordinary temperature 2 per cent.; 90 to 92 per cent. alcohol 1 per cent.; 85 to 87 per cent. alcohol 0.5 per cent. cholesterol. 72 to 75 per cent. isopropylalcohol takes up 1 per cent.; 64 to 65 per cent. isopropylalcohol 0.5 per cent. A small addition of

carbon tetrachloride increases the solubility of cholesterol and prevents it from separating out at changes of temperature. *Formulæ:* (1) Alcohol, 95 per cent., 89 gms.; glycerin, 3 gms.; cholesterol. 0.5 gm.; aqua dest., 6.5 gms.; perfume or essential oils, 1 gm. (2) isopropylalcohol (for medicinal purposes), 66 gms.; glycerin, 3 gms.; cholesterol, 0.5 gm.; aqua dest., 29.5 gms.; perfume, 1 gm. (3) Alcohol, 90 per cent., 75 gms.; isopropylalcohol, 5 gms.; glycerin, 3 gms.; carbon tetrachloride, 3 gms.; cholesterol, 0.25 gm.; pure lecithin, from yolk of egg, 0.1 gm.; perfume, 1 gm.; aqua dest., 13 gms. Generally 0.2 to 0.3 per cent. of cholesterol will be sufficient.—*Dtsch. Parf.-Ztg., 16,* 1930, 75, through *Duedd, Ap.-Ztg., 70,* 57, 402, through *Pharm. Jour.* of New Zealand.

At the Earth's Center—Though it sounds like an unsolvable riddle, perfection of modern scientific methods and instruments have wrested from the world that its core is formed of metallic iron with a little nickel. This conclusion, generally accepted among scientists, dashes speculation which has persisted to recent years that the earth, because it is heaviest at the center, has a heart of gold.

While not troubling to contradict this Jules Verne conception of fabulous wealth unattainably hidden in the middle of the globe, Dr. L. H. Adams of the Geophysical Laboratory of the Carnegie Institution of Washington tacitly refutes any golden dreams of the earth's interior in a report to the Engineering Foundation here.

This earth is made up almost entirely of four elements, iron, magnesium, silicon and oxygen, Dr. Adams says. And the remaining eighty-eight elements (including gold, silver and platinum) are confined to the thin film called the crust.

Directly beneath the relatively thin layer of sedimentary rocks at the surface, there is a first layer of granite ten miles thick; below that a twenty-mile layer of basaltic rock. Two thousand miles of peridotite rock (consisting of iron magnesium silicate) come next, while the centrol core of 4000 miles diameter is formed of metallic iron with a little nickel.

Earthquake waves yielded the important key to the secret of the earth's composition. Earthquakes of any considerable magnitude produce elastic waves, some of which travel along the surface of the earth and others pass through it. By measuring the acceleration and retardation of these waves on passing through the earth

at various depths, the experts are able to judge what sort of rocks and minerals intervene. According to its elasticity, each different kind of rock has a different effect on the speed of the waves passing through it and so it is possible to judge the kinds of strata traversed. —*Science Service.*

Digitalis Preparations—Continued close regulatory control of imported digitalis, as well as of the drug in the crude and tincture form as it enters the channels of trade in this country, is included in plans for 1931 of the drug-control office of the Food and Drug Administration, U. S. Department of Agriculture, according to an announcement by Dr. J. J. Durrett, chief of drug control. "From July 1, 1927, to June 30, 1930," says Doctor Durrett, "Federal officials examined 151 samples of crude digitalis. Of these, only two essayed less than 100 per cent. by U. S. Pharmacopœia definition. In this period, the Department of Agriculture instituted legal proceedings against several manufacturers of digitalis preparations in cases where the preparation did not meet the standards prescribed by the law."

The administration also plans extensive research into the nature and pharmacological properties of both digitalis tincture and the crude drug. "We are aware," says Doctor Durrett, "that there is some deterioration of digitalis tincture after it enters commerce and we are going to try to find the reasons. Preliminary research has convinced us that digitalis preparations are liable to deterioration on the shelves of drug stores or warehouses to some such degree as the administration's investigations proved fluid extract of ergot to be. The ergot studies showed that deterioration set in not long after manufacture and continued for a period, after which the ergot extract no longer had therapeutic value. Upon the strength of this ergot study, the administration recommended to the U. S. Pharmacopœial Revision Committee that ergot extracts be put up in smaller packages, on which the date of manufacture was to be printed, and that the fluid extract be taken from the market as soon as it loses its medicinal value. Many distributors of fluid extract of ergot have adopted this recommendation and are packaging their product in compliance with it. The administration will try to work out methods of insuring the sale only of a tincture of digitalis which has not deteriorated while on the shelves of retail pharmacies."

This work, as well as other activities planned for 1931, is possible because a $75,000 increase in congressional appropriations for enforcement of the food and drugs law, enables the administration to enlarge its staff of scientists engaged in drug-control work. Other plans for the year include continuation of work on alleged antiseptics and so-called remedies for malaria, influenza and other diseases. Increases in the staff dealing with veterinary drug products and in the force of medical men in the drug-control office are also in prospect.

Micro-Colorimetric Method for the Quantitative Determination of Iodine in Blood—The study of the iodine content of human blood and its relation to disease has been delayed because of the lack of suitable methods for its determination in small quantities of blood. A method accurate enough and suitable for clinical investigation may prove of value in the early diagnosis of goitre or make clear the relationship of thyroid activity in other diseased conditions. A micro-colorimetric method is now described for the quantitative determination of iodine in small quantities of blood; 10 cc. of blood are used for each determination. The method requires simple apparatus, and involves oxygen combustion in an open dish, removal of interfering substances, oxidation with bromine, and determination of the iodine by comparison of the colour produced with the starch-iodine reaction. The depth of colour produced in this method by 0.001 mgrm. of iodine in a volume of 1 cc. is sufficient to be read accurately and easily in a micro-colorimeter. The actual amount of iodine liberated to produce the colour is 6 times the amount originally present. The method is applicable for the detection of minute amounts of iodine ranging from 0.0005 mgrm. to 0.005 mgrm. with an error of 10 to 15 per cent. Full details are given of the method and of the reagents required. Tables show the results of iodine determinations on dog blood, and on normal and pathological samples of human blood; the average for normal human blood is 0.011 mgrm. per 100 cc. Oxidation of iodide is carried out in both standard and unknown. The use of the starch-iodide reaction for the colorimetic determination of iodine has often been discouraged because of the numerous factors which may alter the colour production; however, for the determination of so small a quantity of iodine (approximately 0.001 mgrm.) it is believed that titration

with extreme caution cannot secure as accurate a quantitative iodine determination as a colorimetric comparison in a micro-colorimeter with a 0.001 mgrm. standard. It is hoped that this new method, which is more accurate and more easily carried out than the older methods, may be applicable to the detection of iodine in small quantities of milk and tissue.—R. G. Turner (*J. Biol. Chem.*, 1930, *88*. 497-511, P. H. P. through the *Analyst.*)

Poisons Accessible to Children—A serious menace to young children lurks in the sugar-coated tablet and the pink pill when these contain strychnine, Dr. John Aikman of Rochester, has warned in an address before the Rochester Pediatric Society.

The amount of strychnine in each tonic tablet or cathartic pill is not very large. It will not harm the adult for whom the tablets and pills are intended. However, these colored, sugar-coated pills are attractive to small children, much as candy is. Frequent cases of convulsions and death in children under five have been traced to eating large numbers of such tablets unobserved by parents or nurses. The finding of the empty or half-empty bottle later has given the clue to the cause of the child's illness.

"The aggregate amount of strychnine or other poisons thus put in the hands of patients may be surprisingly large," Dr. Aikman said, commenting on the fact that tonic tablets containing strychnine have become household remedies and cathartic tablets have even a more general use.

"The layman is not aware that the tablets contain large amounts of poison, and if he does notice strychnine in the formula he is unfamiliar with the toxic dosage. The package or bottle is left in reach of the small child. The brightly colored sugar or sweet chocolate coating of the tablets is not unlike candy; in fact, just such appearing candies are sold. They are swallowed without mastication or otherwise the bitter taste of the various ingredients would serve as a sufficient safeguard.

"The interval required for the solution and absorption of the tablets makes detection and treatment of the poisoning more difficult. In fact, an attractive and potent poison trap is thus set for the small infant."

Exact figures on the number of deaths of small children from strychnine poisoning are not obtainable. Probably many cases of

convulsions and deaths from unknown causes were really due to strychnine.

"Strychnine is the most serious form of accidental poisoning in children under five years of age," Dr. Aikman stated. He suggested that a poison label should be required by law for all containers of drugs having even a small amount of strychnine. At present, most of the state laws governing the sale of strychnine are not very strict. Strychnine could be omitted entirely from cathartic pills, he found on inquiry among pharmacologists. Failing this, the attractive sugar coating could be left off.

Until some of these measures are taken up, parents should be more careful to keep such pills or tablets on the top shelf, away from the reach of small children.—*Science Service.*

NEWS ITEMS AND PERSONAL NOTES

BENJAMIN L. MURRAY, 1870-1930.

Sad news has just come to hand of the death on December 12th, of Benjamin Lindley Murray, who for many years was chief chemist and in charge of the control laboratory of Merck & Company. He had been ill for several months at his home in Rahway, N. J., but hope had been entertained of his ultimate recovery.

Mr. Murray was widely known and esteemed in drug and chemical circles, and his loss will be mourned by friends and admirers scattered throughout the country. "We shall remember him best for his staunch adherence to the highest standards in carrying on the onerous duties of his responsible position. We placed in him the utmost faith to keep the standards high, and how he kept the faith a great many users of chemicals are in position to add their testimony to ours." That was the tribute paid him by the House of Merck.

As the author of "Standards and Tests for Reagent and C. P. Chemicals" Mr. Murray gained international fame in his chosen field. He served with distinction as a member of the Committee of Revision of the U. S. P. X. His manifold duties and responsibilities brought him into contact with various government officials, particularly those in charge of food and drug administration, and his opinion was frequently sought on the knotty problems confronting them.

Mr. Murray was born at Ypsilanti, Mich., on August 4, 1870. He was graduated from the University of Michigan, and later gained the degree of A. M. at Columbia University. He was associated with Merck & Company for thirty-four years. Among the associations with which he was connected are: The American Chemical Society, the Chemical Society (London), American Electro-Chemical Society, Societe de Chimie Industrielle, Society of Chemical Industry, American Pharmaceutical Association, National Advisory Council University of Michigan, and Sigma Xi (honorary).

Surviving are a widow and three sons, Benjamin, Jay and Edwin, and two brothers and two sisters.

Mellon Institute Announces Industrial Fellowship on Sugar—Dr. Edward R. Weidlein, Director, Mellon Institute of In-

dustrial Research, has announced that the institution has lately begun a broad investigation into possible industrial uses for raw and refined sugar. The research will be carried on by a Multiple Industrial Fellowship that will be sustained by The Sugar Institute, Inc., of New York, an organization that represents the cane sugar refiners of the United States.

The comprehensive program of investigation will be supervised by Dr. George D. Beal, Assistant Director of Mellon Institute, and by Dr. Gerald J. Cox, Senior Industrial Fellow. They and the scientists who will be under their direction in endeavoring to find and to develop uses for sugar in various industries will have the close advisory collaboration of Dr. Leonard H. Cretcher, the sugar specialist who is the head of Mellon Institute's Department of Research in Pure Chemistry.

According to Dr. Weidlein, various studies made by private research workers have already indicated results of industrial promise; these findings will be carefully studied in the laboratories of Mellon Institute. Most of these proposals relate to applications for sugar in such technologic practises as wood preservation, textile finishing, and the manufacture of adhesives. Sugar is thought to merit searching investigation as a basic raw material for employment in various branches of chemical industry.

Four chemists, headed by Dr. Cox, have begun the initial scientific research of the Industrial Fellowship. Additions will be made to this staff, as needed, from time to time.

BOOK REVIEWS

BOOK REVIEWS

THE "WELLCOME" PHOTOGRAPHIC EXPOSURE CALCULATOR AND DIARY, 1931.

Every year the manufacturers of plates, films and printing papers make alterations in their products, improving their speed or modifying their development and colour sensitive characteristics in accordance with the march of progress. Every year the "Wellcome" Photographic Exposure Calculator, Handbook and Diary, which is the only publication providing a complete and independent record of the exposure and development factors of plates and films, is brought up to date. This work alone involves the careful testing of hundreds of plates, films and papers, so that every year amateur and professional photographers obtain the benefit of expert, independent and costly tests by the expenditure of the trifling sum the book costs.

The present edition shows greater signs of activity in this direction than its immediate predecessors owing particularly to development in the speeds and colour sensitiveness of plates which have recently been included.

An entirely new article, "Colour rendering in Monochrome," concentrates, as is the custom with this compact publication, a wealth of sound information in a minimum of space. In these pages the art of the monochrome rendering of colour is put on a practical basis by the inclusion of tables giving the best filters to use with various subjects and the results obtainable, and another table showing which filters to use with various panchromatic plates and films and how much the exposure is increased in each case. This unique article contains grouped information not available elsewhere.

All the other features are maintained and brought up to date. The book is, in fact, as essential a part of the professional or amateur's outfit as anything else he uses. It contains information not elsewhere obtainable and yet so essential for the successful production of photographs that it is the most widely used reference book on the subject. The marvel is that so much information is got into so little space without sacrifice of efficiency and clearness, but we are accustomed to supreme achievement in the art of compression at the hands of the manufacturers of "Tabloid" products.

The "Wellcome" Photographic Exposure Calculator, Handbook and Diary is intended for pocket use and the information is thus kept ready for instant reference. An ample supply of memoranda pages enables personal records to be made of exposure, subjects, etc., on the spot, and the diary pages can be used for general records if desired.

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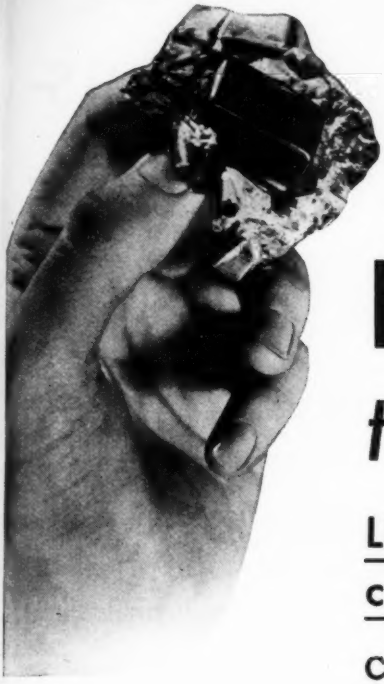

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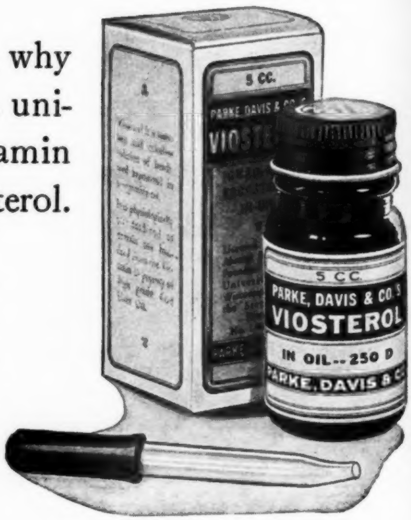

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